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EVALUATION OF SOME AGRICULTURAL DESERT BY-PRODUCTS IN FEEDING CAMELS

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ABSTRACT

Four agriculture desert by-products were chosen (olive pulp, date stones, palm leaf and barley straw), as mainly feeds in desert, for camels to test their availability to eat either of them or when mixed with barley grains as whole ration. Chemical analysis of those by-products showed that, olive pulp contains high EE (15.50 %), CF (22.30 %), while CF of barley straw and palm leaf being 39.84 and 56.10 %, respectively. Three mature males of Sudanese camels (*Camelius dromedaries)* were used to evaluate tested by-products barley grains, date stones and olive pulp in direct metabolism trials, then evaluate olive pulp, date stone, palm leaf, and barley straw) mixed with barley grains by 66% barley + 34 % by-product (w/w) in metabolism trials. Results of direct trials showed significantly ($P<0.05$) higher digestibility and nutritive value as total digestible nutrients (TDN) or starch value (SV) with barley grains than olive pulp and date stones. In mixed feeds trials total digestible nutrients was 62.87 and 66.58 %, respectively with barley + olive pulp and barley + date stones. In the same time, nitrogen balance of all feeds and rations was almost positive.

Rumen activity was studied in direct and mixed feeds for rumen pH, ammonia concentration (NH_3-N) and total volatile fatty acids concentration (TVFA's) at zero time, 3hrs. and 5 hrs., after feeding. Ruminal pH was higher after 5 hrs., for single feeds and their mixtures, while ammonia and total volatile fatty acids concentration recorded highly values at 3 hrs. after feeding for feed mixture. In the same time, barley grains plus date stones mixture recorded low values

of pH and ammonia and VFA's concentration compared with other rations.

Dry matter intake from feeds and their mixes was in normal range, while water intake per day increased with animals fed date stones being 8.42 L compared with barley grains and olive pulp being 7.58 and 6.92 L, respectively. Also, animals fed barley grains + date stones showed insignificantly water intake, being 8.33 L/day.

Results of feed consumption for trails appeared to cover animals requirements per Kg metabolic body weight.

Keywords: *Barley grains, olive pulp, date stone, barley straw, camels*

INTRODUCTION

Camels represent an important source of income in terms of meat and milk production in the arid and semi arid regions which include Arab world and Africa (Gaholt, 1998). In Egypt, there are 110 thousand heads of camels; most of them are concentrated in desert governorates (FAO, 2009).

Digestibility is more a property of the feed than the consumer, but this is not to say that a feed given to different animals will always be digested to the same extent. The most important animal factor is the species of the consumers. Anatomical and physiological differences in the digestive tract of animal species are responsible for variation among them in their ability to utilize different types of feeds in their nutrition. Differences in digestive ability of ruminants and non-ruminants are more detectable when they are fed fibrous feed or agricultural by-products which are better digested by ruminants. There are differences in digestive ability between the different species of ruminants; might be due to the size of digestive tract compartments, rate of passage of digesta, ruminal microorganisms and other factors. These differences give certain species an ecological rich to be adapted to certain environmental condition.

Abou–Akkada(1984) reported that the gap between the availability and requirements of feeds is wide and the estimated 3.1 million tons of TDN per year as a shortage which will be increased to 4.92 million tons TDN by the year 2000. Under such condition, the utilization of un-conventional by-products in feeding animals became an obligation.

Grains should be replaced in animals feeding by agro-industrial by-products, which are not competitive with human food. Effective efforts have been made in orders to utilize crop residues and agro-industrial by-products in manufacturing integrated animals feeds (Abou-Akkada, 1988).

The objective of the present study is evaluating the nutritive value of date stone and olive cake, barley grains and date palm with camels. Moreover, feed intake, waters consumptions and certain rumen parameters were also investigated.

MATERIALS AND METHODS

The present study was carried out at the Experimental Station of Animal Production Department, Faculty of Agriculture, Cairo University, Giza, Egypt, to determine the digestibility's and feeding value of date stones, olive pulp, barley grains and palm leaf in ration of camels.

Animals and feeds:

Voluntary intake and digestability trials were carried out on three adult male camels aged 5 years old, weighed in average 398 kg body weight.

The experimental feeds used in this study were barley grains (BG), date stone (DS), olive pulp (OP), barley straw (BS) and palm leaf (PL). Tested rations were formulated from barley grains by level 66% of DM offered, while the rest 34% was from the chosen agricultural desert by-products. Intake from eaten feeds or rations contribute level 1 % of live body weight of camels. Mineral blocks were available for all animals in the different trials for free choice.

Metabolism trials:

All animals were confined in individual cages during whole the study period. The preliminary period was 21-days to adapt animals for the new consumed feed, and then followed by 7-days as a collection period for urine and feces.

At the end of each collection period rumen liquor samples were withdrawn just before the morning feeding, three and five hours post feeding. Rumen liquor samples were collected through rubber stomach tube attached to electric suction pump. Samples of rumen liquor were strained through two layers of cheescloth and the pH was

recorded immediately after collection using Beckman pH meter. Also ammonia-N was measured directly according to Conway (1957). Strained rumen liquor (SRL) samples were acidified with 0.1N hydrochloric acid and concentrated orthphosphoric acid and the sample were freezed for determination of total volatile fatty acids (TVFA's) according to Warner, (1964).

Chemical analyses:

Feeds and feces were analyzed for proximate analyses according to A.O.A.C., (1990). Nitrogen free extract was calculated by difference. Fiber fractions were analyzed according to Van Soest and Win (1967).

Statistical analyses

Data were analyzed using the general liner model procedure of SAS (1996). One way ANOVA procedure used to analyze the intake, digestibility, and N-retention data following the next model; $y_{ij} = \mu + T_{ij} + E_{ij}$

Were: μ is the overall mean of y_{ij} ; T_{ij} is the feeds or rations effect; E_{ij} is the experimental error. The differences among means were separated according to Duncan's New Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition:

The Chemical composition of the different tested feeds (barley grains (BG), olive pulp (OP), date stone (DS), palm leaf (PL) and barley straw (BS)) and the experimental rations is presented in Tables (1 and 2). The results indicated that content of DM, OM, CP, CF, EE, NFE and ash in olive pulp was similar to that reported by Shawket (1999). Also, the result of proximate analysis for DS was similar to that recorded by El-Shazly *et al.* (1963). Crude protein content of OP and DS (7.29% and 6.61% respectively) was lower than BG (10.2%). Meanwhile they were higher in EE (15.5 % and 6.7, % respectively) than BG (1.97%). Olive pulp (OP) contained 22.3 % crude fiber, this higher than that in date stone and barley grain (14.13 % and 6.51 %, respectively). On the other side, crude fiber in palm leaf and barley straw were higher being 56.10 % and 39.48 % than other tested feeds. In the same time, the NFE content was lower in palm leaf (22.26 %).

Ether extract results showed the same value of barley grains and palm leaf (1.97 %). Content of fiber fraction (NDF, ADF and ADL) was higher in DS and OP than BG. Results of ADL refers to barley straw was lower than olive pulp, date stone and palm leaf by about 50 %.

Table (1). The Chemical composition (%) of tested feeds.

Items	Barley grains	Olive pulp	Date stone	Palm leaf	Barley straw
DM	90.00	91.44	90.48	92.74	92.02
OM	86.55	85.62	88.16	85.48	78.64
CP	10.2	7.29	6.61	5.15	2.19
EE	1.97	15.5	6.7	1.97	0.69
CF	6.51	22.3	14.13	56.10	39.84
NFE	67.87	40.53	60.72	22.26	35.92
Ash	3.45	5.82	2.32	7.26	12.36
NDF	22.74	62.67	61.17	58.61	80.00
ADF	10.53	48.09	54.03	42.28	52.00
ADL	1.53	21.85	18.95	23.40	10.00
Cellulose	9.00	26.24	35.08	18.88	42.00
Hemi-cellulose	12.21	14.58	7.14	16.33	28.00

Table (2). The Chemical composition (%) of tested rations.

Item	Barley grains + Olive pulp	Barley grains + Date stone	Barley grains + Palm leaf	Barley grains + Barley straw
DM	90.48	90.16	90.91	90.73
OM	86.24	87.08	86.19	83.90
CP	9.23	9.00	8.52	7.51
EE	6.48	3.55	1.97	1.54
CF	11.77	9.05	23.04	17.62
NFE	58.76	65.49	52.67	57.22
Ash	4.24	3.07	4.72	6.83
NDF	36.05	35.53	71.22	39.05
ADF	23.05	25.03	55.04	22.4
ADL	8.30	6.82	4.92	4.44
Cellulose	13.00	10.05	50.12	16.65
Hemi-cellulose	14.75	18.21	16.18	17.96

Tested rations given the same content of OM and CP but (BG+BS) was lower in OM and CP content this results were confirm that determine by Gihad *et al*. (1989). Nitrogen free extract of BG+DS

content (65.44 %) was higher than other tested rations this value attributed to NFE content of barley grains and date stone (67.87 and 60.72 %, respectively). Results related to CF showed increasing with barley plus palm leaf ration than BG+DS and BG + OP rations by about 50 %. Also, ADF, NDF and cellulose content (71.22, 55.04 and 50.12 %) of this ration was higher than other rations. On the other hand, all rations had approximately had the same hemicelluloses values.

Digestion coefficients and nutritive values:

Digestion coefficients and nutritive values of the tested feeds and rations showed in Table (3 and 4). Generally BG showed significantly ($P<0.05$) higher digestibility and nutritive value in all nutrients compared with OP and DS except for EE and NDF. In addition, DS showed higher digestibility of all nutrients compared with OP except for EE. No significant differences were noticed between BG and DS in CF, EE, NFE, NDF and ADF digestibility, but there were significant differences ($P<0.05$) in DM, OM and CP digestibility. Also, there were no significant differences between OP and DS in CP and NDF digestibility, but there were significant differences ($P<0.05$) in DM, OM, EE, CF, NFE and ADF digestibility. Similar digestion coefficients were obtained by Bahattacharya *et al*. (1988) and Gihad *et al*. (1989). The DS showed higher digestibility of all nutrients compared with OP except in EE digestibility which was better in OP *vs*. DS (82.13 *vs.* 72.36%, respectively).

Data in Table (3) refers that there were significant differences in starch value among tested feeds being 60.24, 50.44 and 40.29 % of BG, DS and OP. These results attributed to an increase of fiber content in these feeds compared with barley grains. On the other hand, insignificant differences were found among the tested feeds in TDN, but BG significantly recorded ($P<0.05$) higher DCP being 6.71% compared with OP and DS being 3.41 and 3.17%, respectively, while there were no significant differences in DCP between OP and DS.

Mixed rations in Table (4) indicated that the ration contained BG + DS had the highest digestibility in DM, OM, CP, CF and NFE. However, ration contained BG+OP recorded the highest EE digestibility being 87.06% this may be due to the higher % of EE in olive pulp. Also, ration contained BG+PL recorded the lowest digestibility of EE. No significant differences were detected in

digestibility of OM or NFE digestibility among all the experimental rations. The digestibility of ADF and NDF in BG+OP ration was significantly (P<0.05) higher (72.29 and 68.22%) compared with other rations. The ration contained BG+PL was significantly recorded (P<0.05) the lowest value of CP and CF digestibility (52.06 and 51.73 %) compared with other rations. In the same time, ration containing BG+BS was significantly recorded (P<0.05) the lowest EE digestibility being 51.56% compared with other rations. Camel calves gave the same results (Yacout and El-Badawi, 2001).

Results in Table (4) showed that barley grain plus palm leaf ration have a lower value of SV (36.31%) than other rations. No significant differences BG+OP and BG+DS rations in TDN values being 62.87 and 66.58 %, respectively, compared with other two mixes. There were no significant differences among all rations except with the ration contained BG+DS which recorded significantly (P<0.05) the highest value of DCP being 6.13 % compared with other rations. Nitrogen balance with feeds and rations have a positive values, it means that protein level in camels feeds was enough to cover their maintenance requirements.

Table (3). Nutrients digestibility, nitrogen balance and nutritive value of tested feeds.

Item	Barley grain	Olive pulp	Date stone	± SE
Digestibility, %:				
DM	71.97^{a}	48.13^{c}	60.03^{b}	2.78
OM	70.60^{a}	49.97^{c}	60.96^{b}	1.78
CP	65.77^{a}	46.80^{b}	47.90^{b}	2.06
EE	67.73^{b}	82.13^{a}	72.36^{b}	5.86
CF	60.16^{a}	29.13^{c}	46.43^{b}	1.82
NFE	72.40^{a}	47.37^{c}	65.60^{a}	1.23
NDF	56.32^{a}	58.59^{a}	70.27^{a}	3.04
ADF	55.67^{b}	54.80^{b}	72.10^{a}	2.98
Nitrogen balance:				
g/h/d	0.68	0.47	0.59	.02
Feeding values, %:				
SV	60.24^{a}	40.29^{c}	50.44^{b}	5.05
TDN	62.76^{a}	57.75^{a}	60.47^{a}	1.52
DCP	6.71^{a}	3.41^{b}	3.17^{b}	0.17

$^{a,b,c\ldots}$ Means in the same row with different superscripts are significantly different (P<0.05).

Table (4). Nutrients digestibility, nitrogen balance and nutritive values of tested rations:

Item	Barley grains + Olive pulp	Barley grains + Date stone	Barley grains + Palm leaf	Barley grains + Barley straw	± SE
Digestibility, %:					
DM	55.40^{bc}	70.50^{a}	57.73^{a}	53.93^{a}	2.25
OM	64.33^{a}	64.62^{a}	59.03^{a}	58.80^{a}	3.12
CP	48.33^{c}	68.10^{a}	52.06^{b}	52.63^{b}	3.23
EE	87.06^{a}	76.33^{b}	59.26^{c}	51.56^{d}	0.80
CF	29.00^{c}	61.96^{a}	51.73^{b}	57.80^{a}	2.95
NFE	72.00^{ab}	74.43^{a}	59.53^{ab}	67.30^{ab}	2.40
NDF	68.22^{b}	57.77^{b}	51.02^{a}	51.61^{b}	1.39
ADF	72.29^{a}	57.90^{b}	51.11^{b}	51.84^{b}	1.32
Nitrogen balance:					
g/h/d	0.38	0.36	0.33	0.21	0.18
Feeding values, %:					
SV	57.15^{a}	63.14^{a}	36.31^{c}	43.69^{b}	7.00
TDN	62.87^{a}	66.58^{a}	50.33^{b}	54.42^{b}	1.43
DCP	4.46^{bc}	6.13^{a}	4.43^{b}	3.95^{c}	0.15

$^{a,b,c\ldots}$ Means in the same row with different superscripts are significantly different ($P<0.05$).

Rumen parameters:

Rumen liquor parameters of the experimental feeds are summarized in Tables (5 and 6) most of ruminal parameter measured was affected by different types were acceptable with the normal range of rumen parameter. Ruminal pH recorded the highest values with animals fed OP at zero time compared with other feeds. The gradual decrease in pH value over time after feeding was synchronized with gradual increase in ruminal total volatile fatty acids concentration at the same times. Feeding on BG resulted in significant ($P<0.05$) decrease in pH values compared with other feeds after 3 and 5 hrs. In this respect Abdel-Rahman *et al*. (2003), found that the ruminal pH values of four animal species (camels, bulls, sheep and goats) before feeding were 7.5, 6.8, 6.95 and 6.95, respectively, and all pH values after feeding were lower than those before feeding, being 6.78, 6.45, 6.77 and 6.64, respectively.

Ruminal ammonia concentration at zero time was different significantly ($P<0.05$) with camels fed OP (6.16 mg %), followed those by fed on BG then DS (5.83 and 5.59, respectively). At three hours post-feeding, NH_3-N was significantly higher with animals fed

on BG (12.01 mg %) compared with other feeds. There were significant differences in ammonia concentration at 5 hrs., post-feeding with camels fed all feeds. Abdel-Rahman *et al*. (2003) found that ammonia concentration in camels were lower than those reported in bulls, sheep and goats, either before feeding (13.3, 16.10, 16.30 and 15.80 mg/dl, respectively) or at 5 hrs. after feeding (10.0, 19.3, 20.2 and 18.0 mg/dl) in the same order. The beneficial effect of high level of ammonia might be in part due to increasing amount of substrate available for microbial protein synthesis in the rumen (Church, 1988).

Total volatile fatty acids concentration showed significant decrease ($P<0.05$) in values at zero time with camel fed on DS (7.23) compared with other feeds. The production of TVFA's at three hours post feeding was significantly different among feeds where, animals fed on BG recorded the highest value of TVFA's followed by OP then DS (15.71, 14.01 and 11.22 meq/100 ml/RL, respectively). Also, significant differences ($P<0.05$) among feeds at five hours post feeding were showen in production of TVFA's as BG recorded the highest value being 12.76 (meq/100 ml/RL) compared with other feeds.

On the other hand, the ration containing BG + BS recorded the lowest rumen pH value at zero time, after 3 hrs and after 5 hrs post-feeding. The BG + DS mixture ration gave the highest value of rumen pH value at the three tested times. Significant differences ($P<0.05$) were observed among the rations for pH where values ration contained mixture recorded the highest value of rumen pH content after 5 hrs., post feeding compared with other rations. While, The BG+PL mixture ration gave the highest value of NH_3-N at the three tested times. Total volatile fatty acids concentration showed significant decrease ($P<0.05$) values at zero time with camel fed on BG+BS (5.9 meq/dl) compared with other rations. The production of TVFA's at three hours post feeding was significantly different among feeds where, animals fed on BG+PL recorded the highest value (13.63 meq/dl), while the lowest value was recorded with BG+DS ration (10.22 meq/dl). No significant differences among the rations at five hours post feeding in the production of TVFA's. Such results were obtained by Maloiy (1972).

Table (5). Rumen parameters of tested feeds.

Item	Barley grains	Olive pulp	Date stone	±SE
Rumen pH:				
0 time	5.72^{c}	6.61^{a}	6.24^{b}	0.11
3 hrs.	4.83^{b}	5.81^{a}	5.16^{a}	0.15
5 hrs.	5.15^{b}	7.07^{a}	6.93^{a}	0.13
Rumen ammonia (mg %):				
0 time	5.83^{ab}	6.16^{a}	5.59^{b}	0.14
3 hrs.	10.12^{b}	12.01^{a}	9.92^{b}	0.31
5 hrs.	8.32^{a}	8.26^{a}	7.48^{a}	0.28
Total volatile fatty acids (mEq/100RL):				
0 time	8.05^{a}	8.29^{a}	7.23^{b}	0.17
3 hrs.	15.71^{a}	14.01^{b}	11.22^{c}	0.51
5 hrs.	12.76^{a}	9.36^{b}	8.53^{b}	0.41

$^{a,b,c\ldots}$ Means in the same row with different superscripts are significantly different ($P<0.05$).

Table (6). Rumen parameters of tested rations.

Item	Barley grains + Olive pulp	Barley grains + Date stone	Barleygrains + Palm leaf	Barley grains + Barley straw	±SE
Rumen pH:					
0 time	6.19^{a}	6.22^{a}	5.90^{a}	5.34^{b}	0.12
3 hrs.	6.05^{b}	6.72^{a}	6.09^{ab}	5.21^{c}	0.22
5 hrs.	7.21^{b}	7.84^{a}	7.20^{b}	7.01^{b}	0.19
Rumen ammonia (mg %):					
0 time	5.74^{a}	4.53^{b}	5.80^{a}	4.60^{b}	0.10
3 hrs.	12.03^{ab}	8.19^{c}	13.06^{a}	10.86^{b}	0.49
5 hrs.	7.71^{a}	5.77^{b}	7.98^{a}	6.32^{b}	0.24
Total volatile fatty acids (mEq/100RL):					
0 time	7.33^{b}	7.16^{b}	8.20^{a}	5.90^{c}	0.15
3 hrs.	12.32^{a}	10.22^{b}	13.63^{a}	10.53^{b}	0.48
5 hrs.	8.28^{a}	8.65^{a}	8.73^{a}	8.96^{a}	0.43

$^{a,b,c\ldots}$ Means in the same row with different superscripts are significantly different ($P<0.05$).

Feed intake:

The results of feed and water intake are summarized in Tables (7 and 8). No significant differences were detected in dry matter intake expressed as DMI g / $W^{0.75}$ by camels fed on the experimental tested

feeds. Also, there were insignificant differences among the tested feeds in TDN consumed by animals. While, animals consumed DS significantly recorded ($P<0.05$) the lowest value of DCP intake being 126.80 g/h/d or 1.42 g/kgw$^{0.75}$ or 32.10 g/100KgBW compared with BG and OP that recorded 268.40, 2.99 and 66.77 and 136.04, 1.53 and 34.19, respectively. The water intake increased with animals fed DS being 8.42 L compared with BG and OP that recorded 7.58 and 6.92 L, respectively. Such results were obtained by Gihad *et al*., (1989), Kandil *et al*. (1991) and El-Banna (1993).

On the other hand, that animals consumed ration contained BG+DS were recorded the highest water intake being 8.33 L compared with each those consumed rations contained BG+PL, BG+OP or BG+BS which recorded 8.16, 7.25 and 7.50 L, respectively. Insignificant differences were observed among the tested rations in DMI by animals. Significant differences ($P<0.05$) in consumed TDN among animals were where found the ration contained BG+PL had recorded the lowest value of TDN intake being 25.62 g/kgw$^{0.75}$ or 0.57 g/100KgBW compared with other rations. A similar result was obtained by Shawket (1999). Significant differences ($P<0.05$) were detected among the experimental rations where ration contained BG+DS mixture recorded the highest value of DCP intake compared with other rations. While, the ration contained BG+BS recorded the lowest value of DCP intake compared with other rations. Insignificant differences in feed intake were noticed between rations containing BG+PL and BG+OP or BG+OP and BG+BS. The same results were obtained by El-Shazly *et al*. (1963) and Rashed and Alwash (1976).

Table (7). Feed consumption (Dry matter, TDN and DCP) and water intake with tested feeds.

Item	Barley grain	Olive pulp	Date stone	±SE
Live BW	402	399	395	----
$W^{0.75}$	89.78	89.27	88.60	----
Water intake, L	7.58	6.92	8.42	0.690
Dry matter Intake (DMI):				
kg/h/d	4	4	4	NS
g/kg$w^{0.75}$	44.55	44.81	45.15	NS
kg/100kgBW	0.995	1.002	1.013	NS
Total Digestible Nutrients intake(TDN):				
kg/h/d	2.51^{a}	2.31^{a}	2.42^{a}	0.42
g/kg $w^{0.75}$	27.96^{a}	25.88^{a}	27.31^{a}	2.50
kg/100Kg BW	0.62^{a}	0.58^{a}	0.61^{a}	0.01
Digestible Crude Protein intake(DCP):				
g/h/d	268.4^{a}	136.04^{a}	126.80^{b}	6.13
g/kg$w^{0.75}$	2.99^{a}	1.53^{b}	1.42^{b}	0.07
g/100KgBW	66.77^{a}	34.19^{b}	32.10^{b}	10.00

$^{a,b,c\ \ldots}$ Means in the same row with different superscripts are significantly different (P<0.05).

Table (8). Feed consumption (DM, TDN and DCP) and water intake with tested rations.

Item	Barley grains + Olive pulp	Barley grains + Date stone	Barley grains + Palm leaf	Barley grains + Barley straw	±SE
Live BW(kg)	399	397	395	395	---
$W^{0.75}$	89.27	88.93	88.60	88.60	---
Water intake, L.	7.25	8.33	8.16	7.50	0.60
Dry matter Intake (DMI):					
kg/h/d	4.5	4.5	4.5	4.5	NS
g/kg$w^{0.75}$	50.41	50.60	50.79	50.79	NS
kg/100kgBW	1.13	1.13	1.14	1.14	NS
Total Digestible Nutrients intake(TDN):					
kg/h/d	2.83^{a}	3.09^{ab}	2.27^{a}	2.45^{ab}	0.33
g/kg $w^{0.75}$	31.70^{a}	33.73^{a}	25.62^{b}	27.65^{a}	3.22
kg/100Kg BW	0.71^{a}	0.76^{ab}	0.57^{c}	0.62^{ab}	0.13
Digestible Crude Protein intake(DCP):					
g/h/d	200.70^{bc}	275.85^{a}	199.35^{b}	177.75^{c}	6.19
g/kg$w^{0.75}$	2.25^{bc}	3.10^{a}	2.25^{b}	2.01^{c}	0.08
g/100KgBW	50.30^{bc}	69.47^{a}	50.47^{b}	45.00^{c}	4.00

$^{a,b,c\ \ldots}$ Means in the same row with different superscripts are significantly different (P<0.05).

Conclusion:

It could be concluded that date stone and olive pulp can be use to feed camels as substitution of barley grains without any adverse effect. Date stone showed better nutritive value than olive pulp. Also, the mixture of barley grains + olive pulp or date stone gave the best results than other mixtures.

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تقييم بعض المخلفات الزراعية الصحراوية فى تغذية الجمال

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تم اختيار أربعة مواد علف من المخلفات الصحراوية وهى تفل الزيتون، نوى البلح، جريد النخيل و تبن الشعير لتغذيتها للجمال منفردة أو في مخاليط مع حبوب الشعير. وتم تحليلها كيماويا وقد أظهرت النتائج أن تفل الزيتون يحتوى على نسبة عالية من مستخلص الأثير (15.5 %) والالياف الخام (22.30%) بينما كانت نسبة الالياف فى كل من تبن الشعير وجريد النخيل 39.84% و 56.10 % على التوالى وأن نسب تحليل حبوب الشعير كانت فى المدى الطبيعي .

وأستخدم خلال هذه الدراسة ثلاثة ذكور بالغة من الابل السودانية لتقييم حبوب الشعير، لب الزيتون ونوى البلح و جريد النخيل وتبن الشعير منفردة أو كل في مخلوط مع الشعير بنسبة 66% شعير + 34% مخلف فى تجارب تمثيل غذائى. وقد أظهرت نتائج التجارب المباشرة تفوق حبوب الشعير على كل من تفل الزيتون ونوى البلح فى معاملات الهضم العناصر الغذائية والقيم الغذائية كمعادل نشا ومركبات كلية مهضومة. وفى تجارب المخاليط كان مجموع المركبات الغذائية الكلية المهضومة تتقارب فى مخلوطى الشعير مع تفل الزيتون و الشعير مع نوى البلح (62.76 و 60.47 % ،على التوالى).وقد أظهر ميزان الازوت أنه فى حدود الميزان المتعادل.

وقد تم دراسة نشاط الكرش فى التغذية المباشرة ومخاليط الأعلاف حيث قدرت الحموضة وتركيز الأمونيا والاحماض الدهنية الطيارة الكلية على فترات صفر و 3و 5 ساعات من التغذية، وقد كانت أعلى قيم للحموضة بعد 5 ساعات للأغذية المنفردة ومخاليطها بينما سجلت تركيزات الأمونيا والاحماض الدهنية الطيارة الكلية أعلى معدل عند 3 ساعات للأغذية المخلوطة وقد سجل مخلوط حبوب الشعير ونوى البلح أقل قيم لكل من الحموضة والامونيا والاحماض الدهنية الطيارة مقارنة بباقى المخاليط.

كمية المادة المأكوله كانت فى المعدلات الطبيعية. بينما كان هناك زيادة معنوية فى كمية المياه التى شربتها الحيوانات عند التغذية على نوى البلح (8.42 لتر) مقارنة بحبوب الشعير وتفل الزيتون (7.58 و 6.92 لتر، على التوالى). أيضاً سجلت العليقة المحتوية على نوى البلح مع حبوب الشعير زيادة معنوية فى إستهلاك المياه(8.33 لتر). وقد سجلت جميع العلائق تغطية لإحتياجات الحيوانات الغذائية الحافظة لكل كجم من حيز الجسم التمثيلى.